

Claims

What is claimed is:

- 5 1. A disposable absorbent article comprising a nanofabricated attachment means comprising adhesive hairs disposed on a substrate wherein said hairs are effective to adhesively engage an opposing surface comprising a polymeric film or a fibrous web.
- 10 2. The article of claim 1 wherein the attachment means has a packing density of at least 500 hairs per square millimeter.
3. The article of claim 1 wherein said hairs have an average diameter of about 50 microns or less and an average height-to-diameter ratio of about 3 or greater.
- 15 4. The article claim 1 wherein said hairs are effective to adhesively engage an opposing surface comprising a polymeric film or fibrous web with an average adhesive force of 10 nanoNewtons or greater per hair.
- 20 5. A disposable absorbent article comprising a gecko-like fastener including a substrate, a plurality of adhesive hairs rising from said substrate, said adhesive hairs each having a base section, a midsection, a top section, a height of about 0.5 microns to about 8 millimeters, and a diameter greater than about 0.05 microns.
- 25 6. the article of claim 5 wherein said hairs terminate in a plurality of fine terminating elements.
7. The article of claim 5 wherein said hairs have a height of about 2 microns to about 1000 microns.
- 30 8. The article of claim 5 wherein said hairs have a diameter of about 0.05 microns to about 10 microns.
- 35 9. The article of claim 5 wherein said hairs are spaced apart by a first distance of about 1 micron to about 1000 microns.

10. The article of claim 5 wherein said hairs are spaced apart by a second distance of about 1 micron to about 1000 microns.
- 5 11. The article of claim 5 wherein the ratio of a first distance between said hairs to the diameter of said hairs is about 3 to about 100.
12. The article of claim 5 wherein the ratio of a second distance between said hairs to the diameter of said hairs is about 3 to about 100.
- 10 13. The article of claim 5 wherein the ratio of the height of said hairs to the diameter of said hairs is about 2 to about 1000.
14. The article of claim 5 wherein at least one of said hairs is perpendicular to the plane of said substrate.
- 15 15. The article of claim 5 wherein at least one of said hairs is oriented at an angle between 0° and 90° to the plane of said substrate.
- 20 16. The article of claim 5 wherein at least one of said hairs is axisymmetric.
17. The article of claim 5 wherein at least one of said hairs has a base that is axisymmetric and an end portion that is flattened.
- 25 18. The article of claim 17 wherein the ratio of the width of said flattened end to the thickness of said flattened end is about 2 to about 25.
19. The article of claim 17 wherein said flattened end portion occupies about 5-percent to about 80-percent of said height of said hair.
- 30 20. The article of claim 5 wherein at least one of said hairs is hollow.
21. The article of claim 5 wherein said at least one hair comprises hollow materials, microspheres, carbon nanotubes, zeolites, or combinations thereof.
- 35 22. The article of claim 5 wherein said hairs comprise molecules with hollow chambers.

23. The article of claim 22 wherein said molecules are cyclodextrins, crown ethers, polyhedral oligomeric silsesquioxanes, or combinations thereof.
- 5 24. The article of claim 5 wherein said substrate is apertured.
25. The article of claim 5 wherein said substrate is a liquid impervious web.
26. The article of claim 5 wherein the thickness of said substrate comprises a
10 repeating pattern of thickness variations.
27. The article of claim 5 wherein said substrate is creped, embossed, apertured, coated, or combinations thereof.
- 15 28. The article of claim 27 wherein said coating is on at least one side of said substrate.
29. The article of claim 27 wherein said coating is hydrophobic.
- 20 30. The article of claim 27 wherein said coating is hydrophilic.
31. The article of claim 27 wherein said coating is a metal oxide.
32. The article of claim 27 wherein said metal oxide is titanium dioxide treated with a
25 UV absorbing material that is thermally treated.
33. The article of claim 5 wherein said substrate comprises regions of elastic material.
34. The article of claim 5 wherein said substrate is substantially elastic and
30 homogeneous.
35. The article of claim 5 wherein said substrate contains discrete elastic regions separated by less elastic regions.
- 35 36. The article of claim 5 wherein said substrate contains discrete elastic regions separated by inelastic regions.

37. The article of claim 5 wherein said fastener is stretchable.
38. The article of claim 5 wherein said fastener comprises elastic regions.
- 5 39. The article of claim 5 wherein an attachment surface of said fastener is elastic, inelastic, or combination thereof.
- 10 40. The article of claim 5 wherein said fastener is adapted for fastening said article to itself.
41. The article of claim 5 wherein said fastener is adapted for fastening said article to another object.
- 15 42. The article of claim 5 wherein said fastener is adapted for joining two or more components of said article.
43. The article of claim 5 wherein said fastener comprises part of a side seam of said article.
- 20 44. The article of claim 5 wherein said fastener comprises a three-dimensional topography characterized by a series of peaks and valleys.
45. The article of claim 45 wherein said peaks and valleys alternate in first direction.
- 25 46. The article of claim 45 wherein groups of hairs are selectively disposed on said peaks of said substrate, said valleys of said substrate, or combination thereof.
- 30 47. The article of claim 5 wherein said hairs are protected from contamination with other materials until pressed into contact with an opposing surface.
48. The article of claim 5 wherein said hairs are protected with a removable cover.
- 35 49. The article of claim 5 wherein said fastener comprises substantially hair free regions between groups of hair.

50. The article of claim 5 wherein said hairs are disposed substantially uniformly along the fastener.
51. The article of claim 5 wherein said hairs are disposed substantially randomly along the fastener.
52. A disposable absorbent article comprising at least one gecko-like fastener including a thin, flexible base layer onto which has been disposed spaced apart, discrete patches comprising a substrate supporting adhesive hairs rising from said substrate, said adhesive hairs each having a height of about 0.5 microns to about 8 millimeters, and a diameter greater than about 0.05 microns, and substantially adhesive-hair-free regions of said base layer separating said patches.
53. The article of claim 52 wherein said patches are spaced apart in a first direction of said base layer.
54. The article of claim 53 wherein said first direction is in the machine direction.
55. The article of claim 53 wherein said first direction is in the direction in which the base layer is most extensible.
56. The article of claim 52 wherein said substrate is elastomeric.
57. The article of claim 52 wherein said substrate is creped.
58. The article of claim 52 wherein said substrate is foreshortened material that can be stretched in one or more directions.
59. The article of claim 52 wherein said patches are thin films.
60. The article of claim 59 wherein said film has a thickness of less than 50 microns.
61. The article of claim 59 wherein said film has a thickness of about 0.05 millimeters to about 3 millimeters.

62. The article of claim 52 wherein said patches have a Young's modulus greater than that of said base layer.
- 5 63. A method of fastening a disposable absorbent article comprises attaching a gecko-like fastener to an opposing surface, wherein said fastener includes a substrate, a plurality of adhesive hairs rising from said substrate, said adhesive hairs having a height of about 0.5 microns to about 8 millimeters and a diameter greater than about 0.05 microns.
- 10 64. The method of claim 63 wherein said opposing surface is hydrophilic, hydrophobic, or combination thereof.
- 15 65. The method of claim 63 wherein said opposing surface comprises a synthetic material, natural material, or combination thereof.
66. The method of claim 63 wherein said opposing surface comprises composite materials.
- 20 67. The method of claim 63 wherein said opposing surface has a porosity less than ten-percent.
68. The method of claim 63 wherein said opposing surface is a laminate.
- 25 69. A disposable absorbent article comprising a nanofabricated attachment means for fastening said article.